PlantForm Corporation

Optimizing Value for Tobacco and Genetically Modified Tobacco Specialty Crops

Strategic investment
Strategic partnerships
Manufacturing

J. Christopher Hall, PhD
Chief Scientific Officer

www.plantformcorp.com
Proprietary, plant-based manufacturing of monoclonal antibody drugs with:
- Significantly lower cost
- Reduced development timelines
- Lower risk profiles
PlantForm Opportunity

Technology platform will disrupt current mammalian cell-based manufacturing
- Tobacco plant production platform
- High-quality antibodies at low-cost
- Reduced capital cost for production facility

Virtually untapped market for biosimilar drugs
- $80B of biologic drugs go off-patent in the next 5 years
- First target-biosimilar trastuzumab (Herceptin®) $6 billion breast cancer drug
PlantForm Strategy/Business Model

- Leverage proprietary manufacturing platform to produce ultra-low-cost products
  - Low manufacturing costs
  - Accelerated development timeline

**Identify High-Value Biologics**
- Screen biosimilar landscape to rank most attractive opportunities
- Select most promising candidates for development

**Commercialize Applications**
- Achieve platform proof of concept with biosimilar trastuzumab
- Applicable to all antibodies (biosimilar and innovative)

**Out-License Products to Partners**
- Optimal partnership timing is upon completion of PI trial
- Rank potential partners for desired attributes
- “Operating System” business model enables serving many partners simultaneously
- Produce commercial returns & exits for investors

**Value Creation**
## Development pipeline

<table>
<thead>
<tr>
<th>Pipeline #</th>
<th>Drug</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Primary</td>
</tr>
<tr>
<td>1</td>
<td>Biosimilar Herceptin</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>2</td>
<td>Biosimilar Avastin</td>
<td>Colorectal cancer</td>
</tr>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Biosimilar Erbitux</td>
<td>Head and neck cancer</td>
</tr>
</tbody>
</table>
Biosimilar Trastuzumab

Large and growing market
- Trastuzumab (Herceptin®) is the leading antibody drug for HER2-positive breast cancer patients
- Herceptin® sales are $6.0 Billion (2010)
- Expected to grow to $7.4 Billion in 2016

Market for Biosimilar trastuzumabs
- Estimated at > $2B (~30%)

Growth projected in global Herceptin® market

Source: MedTRACK, as of May 2011
PlantForm Biosimilar Strategy

<table>
<thead>
<tr>
<th>Name Brand Drug</th>
<th>Traditional Biosimilar</th>
<th>PlantForm Biosimilar</th>
</tr>
</thead>
<tbody>
<tr>
<td>($3,500/vial)</td>
<td>($2,500/vial)</td>
<td>($1,750/vial)</td>
</tr>
</tbody>
</table>

- Greater profit margin enables flexible market entry strategy
- Ability to compete on price due to low cost of goods
Manufacturing facility to produce 400 kg of antibody drug per year

- **5,000L fermentation**
  - Cost $450M

- **12-acre greenhouse**
  - Cost $80M

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Mammalian Fermentation

PlantForm
PlantForm Summary

- Canadian private corporation established 2008
- Tobacco plant expression technology licensed from the University of Guelph
- $1.5 million in funding from Founders, Angels & Government
- $850,000 available in grant to match new funding
- 3 families of patents filed
Experienced Management

Don Stewart, PhD, CEO
Extensive experience in drug development and management in the biotechnology industry

David Cayea, BA, EMPD, Director International Relations
Experience in international business development in Europe, Middle East and North America

Chris Hall, PhD, CSO
Scientific founder, Canada Research Chair, authority in plant biologics research

Ron Hosking, CA, CFO
CFO experience in both multinational and startup biotech companies and large pharma licensing deals
Drug Development Timeline Comparison

**Innovator Drug**

- **Discovery**: 5 years
- **Preclinical**: 1.5 years
- **Clinical**: 6 years
- **Review**: 1 year
- Total: 13.5 years

- **Phase I (PI)**: 20-100 patients
- **Phase II (PII)**: 100-500 patients
- **Phase III (PIII)**: 1,000-5,000 patients

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**Biosimilar Biologic**

- **Preclinical**: 1.5 years
- **Clinical**: 3 years
- **Review**: 1 year
- **Total**: 5.5 years

- **Phase I (PI)**: 40-50 patients
- **Phase II (PII)**: Not required
- **Phase III (PIII)**: 100-500 patients

*Time Saved:*
## Antibody Production Systems

<table>
<thead>
<tr>
<th>Expression System</th>
<th>Time to Milligrams of Antibody</th>
<th>Time to Grams of Antibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammalian cell culture</td>
<td>2-6 months</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Transgenic animals</td>
<td>&gt;12 months</td>
<td>&gt;12 months</td>
</tr>
<tr>
<td>Stable transgenic plants</td>
<td>12 months</td>
<td>&gt;24 months</td>
</tr>
<tr>
<td>Plant Magnification</td>
<td>14 days</td>
<td>14-20 days</td>
</tr>
</tbody>
</table>

Purification Scheme

Grinding
\[\rightarrow\]
Homogenization
\[\rightarrow\]
Centrifuge
\[\rightarrow\]
Microfiltration (TFF)
\[\rightarrow\]
Protein A Chromatography
\[\rightarrow\]
SP Sepharose Chromatography
\[\rightarrow\]
Ultrafiltration
\[\rightarrow\]
Purified mAb
Purity of Plant-Produced Trastuzumab

Immunoblot (NR)

M  Plant trastuzumab  Herceptin®

250  150  100  75  50  37  25  20  15

Immunoblot (R)

M  Plant trastuzumab  Herceptin®

250  150  100  75  50  37  25  20  15

HC  LC
Plant-produced Trastuzumab Inhibits the Growth of HER2 Positive Cancer Cells

BT-474 HER2 over expressing cell line

- Negative Control
- Plant-produced trastuzumab
- Commercial Herceptin®
Manufacturing Process

1. [Image of greenhouse structure]
2. [Image of green plants]
3. [Image of plant propagation machine]
4. [Image of equipment with a blue circular component]
5. [Image of a large greenhouse]
6. [Image of people in protective clothing working in a laboratory setting]
Development Approach and Results

**Activity**
- Laboratory process
- Technology transfer to CMO
- Process optimization
- 1kg biomass process
- Scale-up to 10 kg biomass process
- Scale-up to 50 kg process
- 50 kg process runs
- Animal efficacy study
- 500 kg process run

**Status**
- **Initial product characterization:**
  - *In vitro* demonstration of activity
  - Pharmaceutical grade purity (99%)
  - Product comparable to Herceptin®
  - Correct amino acid sequence
  - Modified glycosylation shown

**Timeline:**
- 2008/9
- 2010
- 2011
- Q1 2011
- Q4 2011
- 2012

Product Pipeline

Biosimilar Antibodies

Trastuzumab (Herceptin®)
Breast cancer

Other biosimilar antibodies
Cancer/inflammatory disease

Market Entry
2015-2016
2017-2018
## Product Pipeline

- Selection criteria applied to determine subsequent monoclonal antibody candidates for future product development

<table>
<thead>
<tr>
<th>Group</th>
<th>Product</th>
<th>Disease Area</th>
<th>Sales Estimate (2013)</th>
<th>Potential to Generate New Market</th>
<th>Patent Expiry</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next candidates</td>
<td>Avastin</td>
<td>Oncology</td>
<td>$8.9 billion</td>
<td>✓</td>
<td>2017</td>
<td>Matches requirements</td>
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<tr>
<td></td>
<td>Erbitux</td>
<td>Oncology</td>
<td>$2.2 billion</td>
<td>✓</td>
<td>2016</td>
<td>Matches requirements</td>
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<tr>
<td>Rejected candidates</td>
<td>Enbrel</td>
<td>Inflammatory Disease</td>
<td>$7.8 billion</td>
<td>✓</td>
<td>2014</td>
<td>Patent expiry not in correct timeframe</td>
</tr>
<tr>
<td></td>
<td>Humira</td>
<td>Inflammatory Disease</td>
<td>$8.7 billion</td>
<td>✓</td>
<td>2014</td>
<td>Patent expiry not in correct timeframe</td>
</tr>
<tr>
<td></td>
<td>Remicade</td>
<td>Inflammatory Disease</td>
<td>$7.7 billion</td>
<td>✓</td>
<td>2014</td>
<td>Patent expiry not in correct timeframe</td>
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<tr>
<td></td>
<td>Rituxan</td>
<td>Oncology / Inflammatory</td>
<td>$5.7 billion</td>
<td>✓</td>
<td>2013</td>
<td>Market fractured by multiple competitors including plant based system</td>
</tr>
<tr>
<td></td>
<td>Synagis</td>
<td>Respiratory Disease</td>
<td>$1.1 billion</td>
<td>✗</td>
<td>2013</td>
<td>Market does not meet size requirements</td>
</tr>
<tr>
<td>Type</td>
<td>Investors</td>
<td>Amount (Million)</td>
<td>Date</td>
<td>Milestones</td>
<td>Value (Million)</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
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<td>------------------------------------------------</td>
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</tr>
</tbody>
</table>
| Round 1     | Angels, Government | $1.5 (Completed) | 2011      | 1. Demonstrate manufacturing  
2. Efficacy study in mice | $5-7.5          |
| Round 2     | Series A        | $10.0            | 2011-2013 | 1. Manufacturing for Phase I  
2. IND package  
3. IND Submission  
4. Phase I clinical trial | $50             |
| Round 3     | Series B, Partner | $23.5 ($55.0)    | 2014-2015 | 1. Manufacturing for Phase III  
2. GMP process validation  
3. Phase III Clinical Trial  
4. License submission | $250            |
PlantForm Corporation

The core research to develop PlantForm would not have been possible without the **Strategic investment** and **Strategic partnership** provided by OMAFRA for over two decades.